ORIGINAL

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Petition for Rule Making of	)	File No. RM-_____
SAVI Technology, Inc.;	)	
Amendment of Part 15 to Permit	)	
Broader Data Transmission Capabilities	)	

To: The Commission

PETITION FOR RULE MAKING OF SAVI TECHNOLOGY, INC.

Pursuant to Section 1.401 of the Commission's Rules,[1] SAVI Technology, Inc. ("SAVI") hereby submits a Petition for Rule Making requesting initiation of a rule making proceeding to amend Part 15 of the Commission's rules to permit greater flexibility for radio frequency identification ("RFID") systems.

SAVI has developed a suite of radiolocation and wireless inventory control products that function as an active tag/interrogator RFID system. Due to the inflexible duty cycle and field strength requirements of Section 15.231 of the Commission's Rules,[2] however, SAVI cannot satisfy customer demands for increased RFID system capabilities that are well within its technological capabilities. Accordingly, SAVI respectfully requests the Commission to initiate a rule making proceeding to relax duty cycle limitations and field strength limits as they apply to RFID products. The Commission could accomplish this objective by either (1) amending

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1 *See* 47 C.F.R. § 1.401.

2 *See* 47 C.F.R. § 15.231.

Section 15.231 or (2) promulgating a new rule section that provides RFID applications greater flexibility. As explained in detail below, with only minor modifications to the duty cycle and field strength limitations, SAVI and other RFID manufacturers could deploy equipment that would satisfy market demands with minimal interference impact on existing systems.

I. Background

SAVI's RFID system has a variety of uses, including, among other applications, the control of material for the Bosnia peacekeeping deployment. The RFID system has proven effective for tracking, tracing, and controlling the flow of supplies on a cost-effective basis for both government and commercial applications. SAVI products fall into two broad categories: active tags and interrogators. The active tags are battery operated and contain a simple processor, 128 kilobytes of memory, and a radio transceiver operating in the 433 MHz band. These tags are designed to be attached to crates or other freight containers with the memory unit programmed with the contents of the containers. In typical military forward deployment applications, a particular crate may contain a dozen different products needed by field personnel. In industrial and commercial applications, on the other hand, typical shipping containers house only one or two types of products.

The system's interrogators are designed to operate in conjunction with the active tags to provide an adaptable, flexible material management system. One type of interrogator, for example, can be mounted at a facility receiving gate to track material as it arrives at a plant with an effective wireless communications range of approximately 100 meters. As an example of a commercial application, tractor trailers bearing large amounts of cargo could be automatically interrogated as they arrive at the plant, the contents of the truck registered in a database, and

temporary parking space assigned for the trailer unit. As plant personnel on the production line run low on particular subassemblies, the database could be searched, the trailer parking space determined, and an order issued to bring the trailer to the particular line. This type of operation allows the plant to almost entirely dispense with expensive storage facilities and facilitates highly cost-effective "just-in-time" production.

SAVI's system is also utilized at seaports to locate and identify containers. SAVI's RFID tags are used to conduct surveillance and inventory of the items within containers while they are at port and to identify when these containers leave port. To identify arrival and departure of the containers with RFID tags, a single interrogator is installed at the gate(s) where containers enter and depart the port on land conveyances. To conduct periodic inventories and identify when tagged cargo leaves by sea or air, two to five interrogators are installed at fixed locations at the port.

This suite of RFID products is currently authorized under Part 15 of the Commission's rules. Under Section 15.3(o) of the Commission's rules, the active tag is classified as an intentional radiator.[3] As an intentional radiator, under Section 15.209(a) for the frequency 433.92 MHz, there would be no restrictions on operation of the product if emissions do not exceed a field strength of 200 μV/m at 3 meters.[4] However, because its tags and interrogators emit an average field strength of less than 4400 μV/m at 3 meters, SAVI has obtained authorization to market the products under Section 15.231 of the Commission's rules.[5]

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[3] *See* 47 C.F.R. § 15.3(o).

[4] *See* 47 C.F.R. § 15.209(a).

[5] Section 15.231(e) provides a frequency dependent power limit determined by using linear interpolations between a limit of 1500 μV/m at 3 meters for 260 MHz and a limit of 5000 μV/m at 3 meters for 470 MHz. At 433.92 MHz, this limit is approximately 4400 μV/m at 3 meters.

SAVI's interrogators are licensed under Section 15.231(a) of the Commission's rules. The "wakeup", "hello" and "sleep" control signals from the interrogator are used to trigger transmission of specific information (tag ID and status) from the tags to the interrogator.[6] Because the tags transmit data, SAVI's tags are authorized under Section 15.231(e), which permits periodic operation, provided: (1) emissions do not exceed an average field strength of 4400 μV/m at 3 meters; (2) the duration of each transmission is no greater than one second; and (3) the silent period between transmissions is at least 30 times the duration of the transmission but is never less than 10 seconds.[7]

As the RFID system currently operates, the tags only transmit information on specific items within the container back to the interrogator. Given the limited data provided by the tags, all transmissions can be completed within the 1 second limitation of Section 15.231(e) with a 10-to-1 duty factor, which allows the tags to operate under Section 15.35[8] with a peak power necessary to achieve a 100-meter range. In complying with these requirements, the field strength limit for a device operating in the 420 to 450 MHz band would be permitted a field strength of 110,000 μV/m at 3 meters, with a limitation on the duty cycle of operation. While this field strength limit allows effective operation of RFID products, it unnecessarily limits the amount of data that can be conveyed by such systems.

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[6] The "wakeup" transmission alerts all tags in the area so that further communication can take place. Once the "wakeup" transmission is sent, the "hello" signal is transmitted beginning the communication link. The hello command will occur 4 to 30 times during a collection cycle depending on the number of tags in range of the reader. Once all transmissions are complete, the "sleep" transmission is sent, commanding all tags in range to transition to a silent or sleep mode.

[7] *See* 47 C.F.R. § 15.231(e).

[8] *See* 47 C.F.R. § 15.35.

II. Issues for Consideration

Given the popularity and usefulness of SAVI's RFID system, there is increasing consumer demand for tags that can "download" up to 128 kilobytes of data to the interrogator. Although the current regulations governing RFID operations permit data downloads that are fully satisfactory for radiolocation operations in most cases, occasionally a large amount of varying material and equipment is contained in a single container, necessitating the transfer of larger amounts of information. In addition, customers would like the ability to program the tags with up to 128 kilobytes of data *via* the wireless RF link instead of having to dock each tag individually with the docking station. In such circumstances, an RFID system is unnecessarily hamstrung by the current restrictions found in Part 15 of the Commission's rules.

With the Section 15.231(e) duty cycle limit of 1 second, a download of tag contents could take up to 30 minutes. Therefore, for purposes of data transmission, SAVI asks the Commission to consider relaxing the period of time to measure the duty cycle to 120 seconds for interrogator and tag Read and Write modes. This will permit the longer data downloads occasionally needed for SAVI's tags that contain up to 128 kilobytes of data. In addition, the silent period specified in Section 15.231(e) could be codified as 10 seconds minimum for each unique tag and interrogator transponder transmission (or radio link), to further clarify this requirement.

With respect to control transmissions, Section 15.231(a)(3) governs and allows periodic transmissions as long as the periodic rate of transmission does not exceed one transmission of not more than one second duration per hour for each transmitter. SAVI believes this requirement is onerous and could be replaced with a requirement for a 10 percent duty cycle with no periodic transmission restriction. Similarly, the field strength limits for control transmissions could be

relaxed in accordance with the present averaging rules of Section 15.35. This would permit field strengths of up to 110,000 μV/m at 3 meters for control transmissions, regardless of duty cycle or transmission time.

These modifications allow for full 128 kilobyte data transmission without increasing the possibility of additional interference since the range of 100 meters would be maintained as would the overall power and field strength limitations.

SAVI suggests that the Commission proceed in one of two possible directions: (1) modify the existing Section 15.231 rules to permit higher data rate RFID applications or (2) add a new Section to the rules to permit specific high data rate applications in the 420 to 450 MHz band. For the Commission's convenience, SAVI has attached a proposed Section 15.231 with suitable modifications at Appendix A; similarly, SAVI has attached a new Section at Appendix B. Either of these approaches would enable RFID manufacturers the flexibility to provide more robust RFID products to the marketplace. If there is concern that these proposals are overly broad, Appendix C provides another, more narrow new Section that could still allow more robust RFID data operations.

III. Conclusion.

The Commission should encourage the flexible use of the unlicensed spectrum governed by Part 15 of its rules by modifying the existing limitations on RFID products. Initiation of a rule making proceeding to relax limitations on duty cycles and field strength limits would serve the public interest by permitting a greater number of uses of RFID equipment without endangering existing and future users of the spectrum. RFID products will become more robust and responsive to market demands. Accordingly, for the foregoing reasons, SAVI respectfully

requests the Commission issue a Notice of Proposed Rule Making to amend Section 15 of its rules by either adopting a new section or by modifying existing regulations to permit greater flexibility for RFID systems.

Respectfully submitted,

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Appendix A
Changes to Existing Section 15.231

§15.231 Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.

(a) The provisions of this section are restricted to periodic operation within the band 40.66-40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Radio control of toys is not permitted. Continuous transmissions, such as voice or video, and data transmissions are not permitted. The prohibition against data transmissions does not preclude the use of recognition codes. Those codes are used to identify the sensor that is activated or to identify the particular component as being part of the system. The following conditions shall be met to comply with the provisions for this periodic operation:

(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions to determine system integrity of transmitters used in security or safety applications are allowed if the periodic rate of each transmission does not exceed one transmission of not more than one second.

(4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

(b) In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	1,250 to 3,750	125 to 375
174-260	3,750	375
260-470	3,750 to 12,500	375 to 1,250

Above 470	12,500	1,250

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, as measured with a CISPR quasi-peak detector, whichever limit permits a higher field strength.

(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

(d) For devices operating within the frequency band 40.66-40.70 MHz, the bandwidth of the emission shall be confined within the band edges and the frequency tolerance of the carrier shall be ±0.01%. This frequency tolerance shall be maintained for a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

(e) Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation, including operation prohibited in paragraph (a) of this section, provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this section, except the field strength table in paragraph (b) of this section is replaced by the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66-40.70	1,000	100
70-130	500	50

130-174	500 to 1,500	50 to 150
174-260	1,500	150
260-470	1,500 to 5,000	150 to 500
Above 470	5,000	500

In addition, commercial and industrial devices operating above 260 MHz used to exchange data and operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than 120 seconds with peak field strength limits of not more 110,000 microvolts/meter when measured at 3 meters.

Appendix B
Addition of a new Section 15.XXX

§ 15.XXX Operation in the band 420 – 450 MHz.

(a) Operation under the provisions of this section is restricted to devices that use radio frequency energy to locate and identify devices and to exchange data. Devices operated pursuant to the provisions of this section shall be digital data devices and not be used for voice communications.

(b) The field strength of any emissions radiated within the specified frequency band shall not exceed 110,000 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing and average detector. The provisions in 15.35 for limiting peak emissions apply.

(c) The field strength of emissions radiated on any frequency outside of the specified band shall not exceed the general radiated emission limits in 15.209.

(d) The device shall be self-contained with no external or readily accessible controls, which may be adjusted to permit operation in a manner inconsistent with the provisions in this section. Any antenna that may be used with the device shall be permanently attached there to and shall not be readily modified by the user.

Appendix C
Addition of a new Section 15.XXX

§ 15.XXX Operation in the band 425 – 435 MHz.

(a) Operation under the provisions of this section is restricted to devices that use radio frequency energy to locate and identify devices and to exchange data. Devices operated pursuant to the provisions of this section shall be digital data devices and not be used for voice communications.

(b) The field strength of any emissions radiated within the specified frequency band shall not exceed 110,000 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing and average detector. The provisions in 15.35 for limiting peak emissions apply. Additionally, devices authorized under these provisions shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than 120 seconds and be only permitted to reinitiate an interrogation in the case of a transmission error. Absent such a transmission error, the silent period between transmissions shall be not less than 10 seconds.

(c) The field strength of emissions radiated on any frequency outside of the specified band shall not exceed the general radiated emission limits in 15.209.

(d) The device shall be self-contained with no external or readily accessible controls, which may be adjusted to permit operation in a manner inconsistent with the provisions in this section. Any antenna that may be used with the device shall be permanently attached there to and shall not be readily modified by the user.